JOB NO.: IGS09-07 W.O. #09-68783-0

TITLE: Variable Clearance LP Packing and Radial Spill Strips

DESCRIPTION: Replace LP Turbine interstage packing and spill strips with advanced design.

JUSTIFICATION: ECONOMIC

RATE OF RETURN: 59 percent
PAYBACK PERIOD: 1.7 years
BENEFIT/COST RATIO: 4.6
ECONOMIC LIFE: 10 years
PV SAVINGS: $3,916,000
SALVAGE VALUE: $4,000

ADDITIONAL DETAIL: LP turbine interstage packing and spill strips are scheduled to be replaced during the 2010 and 2011 outages. Installing advanced design packing and spill strips instead of conventional packing will improve net plant heat rate 0.36 percent by reducing steam leaks between LP turbine stages. Advanced design packing and seals also have provisions to minimize wear over time.

COST ESTIMATE:

	2010-2011	Total
Engineering Labor	$6,000	$6,000
IPSC Labor	$4,000	$4,000
Contractor Labor	$112,000	$112,000
Material	$964,000	$964,000
Job Total	$1,086,000	$1,086,000

ALTERNATIVES: Alternative 1: Do not replace LP packing and seals. Leakage from worn packing and seals will continue to increase through the next LP outage interval (10 years) with resulting increase in heat

rate and fuel consumption.

Alternative 2: Replace LP packing and seals with conventional design packing and seals. Maintenance overhaul budget will have to be increased by $781,000 for these packing and seals. Heat rate losses from interstage steam leaks will be restored to close to design values initially but will degrade over time.

EFFECT OF DEFERRAL: Higher LP turbine stage losses resulting in higher heat rate and fuel consumption. Next opportunity to install improved LP turbine packing is in 10-plus years.

PROJECT HISTORY: None, first year.

INTERMOUNTAIN POWER SERVICE CORPORATION

☒ REQUISITION FOR CAPITAL EQUIPMENT

☐ PURCHASE AUTHORIZATION FOR EXPENSE ITEMS

Purpose of Materials, Supplies or Services:

Low Pressure Turbine Packing and Seals

Date:
Req./PA No: 270903
P.O. No:
Vendor:
Terms:
FOB:
Ship Via:
Conf. To:

Suggested Vendor: Competitive Bid

Account No. 00-1TGX-402

Work Order No. 09-68783

Project No. IGS-09-07

Qty	Unit	Description Noun Adjective	Catalog #	Seller or Manufacturer	Unit Cost	Extension
1	1	New Unit 2 Low Pressure Turbine Packing and Seals with installation for Fall 2010 outage				$543,000.00
1	1	New Unit 1 Low Pressure Turbine Packing and Seals with installation for Spring 2011 outage				$543,000.00
		TOTAL ESTIMATED COST				$1,086,000.00

Remarks:

Delivery requested by [Date] 10-16-10 Originator Spence

Dept. Mgr/Supt. Date | Station Manager Date | Operating Agent Date

IP7020475

MEMORANDUM

INTERMOUNTAIN POWER SERVICE CORPORATION

TO: Jon A. Finlinson

FROM: Jon P. Christensen

DATE: July 14, 2010

SUBJECT: Approval for Capital Project IGS09-07 - Low Pressure Turbine Packing and Seal

Please approve Requisition 270903 for Capital Project IGS09-07 to purchase and install Low Pressure turbine Packing and Seals. The purpose of this project is to install advanced design packing and seals to reduce LP turbine internal steam leakage. These new seals will improve LP turbine efficiency and station heat rate.

The total budgeted cost for this project is $1,086,000. We are trying to get this contract awarded for delivery this Fall during the Unit 2 outage and next Spring for the Unit 1 outage.

DCS:jmj

Attachments

MEMORANDUM

INTERMOUNTAIN POWER SERVICE CORPORATION

TO: Jon A. Finlinson

FROM: Jon P. Christensen

DATE: August 9, 2010

SUBJECT: Approval for Capital Project IGS09-07 - Low Pressure Turbine Packing and Seal

Please approve Requisition 270903 for Capital Project IGS09-07 to purchase and install Low Pressure turbine packing and seals. The purpose of this project is to install advanced design packing and seals to reduce LP turbine internal steam leakage. These new seals will improve LP turbine efficiency and station heat rate.

The total budgeted cost for this project is $1,086,000. We are trying to get this contract awarded for delivery this Fall during the Unit 2 outage and next Spring for the Unit 1 outage.

DCS/JKH:jmj

Attachments

INTERMOUNTAIN POWER SERVICE CORPORATION

BID TRANSMITTAL

TO: *Jon Christensen* DATE: *August 19, 2010*
Department Head

REQUISITION NO. *270903* BID NO. *45848*

REQUISITIONER *Dave Spence*

BRIEF DESCRIPTION *LP Turbine Packing & Seals*

Your prompt recommendation of award is desired on the attached bids. Recommendation should be made to the lowest bidder, or bidders, conforming to specifications. If proposal of lowest bidder, or bidders, cannot be accepted, reason must be stated in detail. Please advise by *08/31/10*.

ANALYSIS OF BIDS:

[x] On a basis of price, Turbo Care Inc is the lowest bidder quoting as shown below.

1. Turbo Care Inc.	$344,014.00/unit
2. Star Field Fit	$370,000.00/unit
3. Mechanical Dynamics	$549,416.00/unit
4. GE Energy	$924,820.00/unit

Tracy Bennett 8/19/10
Buyer

Purchasing Review 08/19/10

RECOMMENDATIONS BY REQUISITIONER:

Approved by Department Head

Date

IP7020478

INTERMOUNTAIN POWER SERVICE CORPORATION

BID EVALUATION SHEET

RFQ NO. 11-45848 TITLE: **Low Pressure Turbine Packing & Seals** DATE: August 19, 2010

Bidder	Shaft Packing & Seals	Installation	Cost Per Unit	[illegible]	[illegible]	[illegible]
Turbo Care Inc	$292,563.00	$51,451.00	$344,014.00	-	2	$688,028.00
Star Field Fit	$315,000.00	$83,000.00	$398,000.00	-	2	$$796,000.00
Mechanical Dynamics	$441,016.00	$108,400.00	$549,416.00	-	2	$1,098,832.00
GE Energy	$774,820.00	$150,000.00	$924,820.00	0	2	$1,923,620.00

Recommendation: Award to________________________, lowest bidder offering service and/or materials in compliance with the specifications..

IPSC DEPARTMENT HEAD APPROVAL: ________________________ **DATE:** __________

IPSC MANAGEMENT APPROVAL: ________________________ **DATE:** __________

OPERATING AGENT'S AUTHORIZATION: ________________________ **DATE:** __________

IP7020479

Project Title: LP turbine advanced design packings WO # 09-68783-0 Date: 8/6/2008

Project Cost ($)	1,086,000	Total cost of project including material and labor in current dollars
Salvage Value of Old Equipment ($)	4,000	Salvage value of existing equipment that will be removed.
Initial Savings ($)		Savings that will be obtained at project installation.
Total Coal Savings (Ton/yr)		List the tons of coal that will be saved annually as a result of the project.
Total Fuel Oil Savings (Gal./yr)		List the gallons of fuel oil that will be saved annually as a result of the project.
Power Savings (MWhr)		List the annual auxillary power savings that will result from the project.
Other Savings ($)		List the annual savings that will result such as maintenance savings.
Annual Costs With the new Equipment ($)	0	List the annual costs associated with the new equipment such as maintenance costs.
Future Salvage Value New Equipment($)	0	List the expected salvage value of the new equipment at the end of the project life.
Project Life (Years)	10	

Note: For non-annual payments or savings, use sheet 2.

Total Coal Cost ($/Ton)	38.77
Total Fuel Oil Cost ($/Gal)	3.5
Replacement Power Cost ($/MWhr)	50
Cost of Money (%)	8
O&M Escalation (%)	3

Present Value of Project	$3,915,695
Benefit/Cost Ratio	4.62
Payback Period	1.7
Rate of Return	59%

Notes and Assumptions:

Justification based on TurboParts LLC proposal T07-1577 (8/7/07).
Advanced design seals are Guardian packing rings and Vortex Shedder spill strips.
They estimate 1.4 MW/LP section or 4.2 MW additional LP output from advanced design pkgs and seals.
This works out to -0.36% change in NPHR or -36 Btu/kwh (9400 nphr base). See project notes for this calc.
Added hrcost and evaluation criteria sheets to this book to calculate annual svgs from heat rate change.
Modified payback period calc to use annual savings from annuity. The calcs on the next page wouldn't do this.
See evaluation criteria for fuel costs, capacity factors, and everything else used for this calculation. Note that no values for fuel cost were provided. Used fuel costs from LP turbine uprate options study which are based on 06-07 costs.
Did not factor in the cost of conventional pkg which would come from outage budget if this project was not done.

Prepared by: D Spence 080608

Note: Enter unequal payments as future dollars. Account for inflation etc.
Enter Unequal Savings and Costs as positive numbers.

	Annual Savings	Unequal Savings	Unequal Costs	Rate of Return Series	Period Present Values
Project Cost	-1,082,000			-1,082,000	-1,082,000
1	0	400,000		400,000	370,370
2	0	800,000		800,000	685,871
3	0	800,000		800,000	635,066
4	0	800,000		800,000	588,024
5	0	800,000		800,000	544,467
6	0	800,000		800,000	504,136
7	0	800,000		800,000	466,792
8	0	800,000		800,000	432,215
9	0	800,000		800,000	400,199
10	0	800,000		800,000	370,555

		Project Cost	1,082,000
		Annual Savings	0
		Escalation (%)	3
		Cost of Money (%)	8
		Periods (Years)	10
		ln	0.05
Rate of Return	59%		
Net Present Value	3,915,695		
Payback Period	1.68		
Annuity PV	4,997,695	NPV w/o Inflation	3,230,267
Annual Savings from Annuity	642,655	IRR Guess	0.1

Cost of Heat Rate (%)

$1.66	Fuel Cost ($/mmBtu)
900	Net Capacity)
90.00%	Net Capacity Factor
9400	Net Heat Rate (Btu/kwh)
0.36%	Percent Heat Rate Change
8760	Period Hours
$400,805	Annual Savings/Cost ($/yr)
$33,400	Monthly Savings/Cost ($/m)
$1,098	Daily Savings/Cost ($/d)
$46	Hourly Savings/Cost ($/h)

Cost of Heat Rate Change - $/Btu/kwh

$1.66	Fuel Cost ($/mmBtu)
900	Net Capacity)
90.00%	Net Capacity Factor
34.00	Btu/kwh
8760	Period Hours
$400,476	Annual Savings/Cost ($
$33,373	Monthly Savings/Cost (
$1,097	Daily Savings/Cost ($/(
$46	Hourly Savings/Cost ($

$/yr)
($/m)
d)
$/h)

Economic evaluation criteria used for 2009 budget justifications

Evaluation Criteria		
Outage year	2010	
Escalation (%)	3.00%	
Cost of Money (%)	8.00%	
Evaluation Period (yr)	10	
NPHR (Btu/kwh)	9500	
Net Capacity Factor (%)	90%	
Replacement Energy ($/MWh)	$50.00	
Fuel Cost ($/ton)	$38.77	38.77
Fuel Cost ($/mmBtu)	$1.66	1.66
CO2 tax ($/ton)	$0.00	

FY 06-07 Production Values	
Total fuel cost ($1,000's)	231,047.0
Net station generation (gwh)	14,686.0
Total coal burned (ktons)	5,959.9
Coal HHV (Btu/lb)	11,686
NPHR (Btu/kwh)	9,491
Net Capacity Factor (%)	93.1

Bid Evaluation for IGS09-07 LP Turbine Replacement Packing & Seals

$1,086,000 Project Budget
Contract is for both units
Costs in this evaluation are for one unit installation

	TurboCare	STAR	MDA/TurboParts	GE
Conventional packing & seals	292,563	292,000	441,016	774,820
Installation	51,451	78,000	108,400	150,000
Total/unit	344,014	370,000	549,416	924,820
Advanced Design packing & Seals	487,563	315,000	523,120	
Installation	51,451	83,000	108,400	
Total/unit	539,014	398,000	631,520	not offered
Advanced design details:	Retractable pkg stgs 16-20 with reduced running clearances on top and sides (.010 less than design clrnc). Bottom segment at design clrnc (0.035). Standard radial spill strips and end pkgs at design clearances	Sensitized pkg in glands (end pkgs). Conventional pkg and seals in inter-stage and radial spill strips.	Guardian pkg and Vortex Shedder radial spill strips. Change to straight-tooth pkg with Guardian post to protect the teeth. Conventional end pkg	
Performance improvement from advanced design	-0.189% (-17.9 Btu/Kwh) NPHR change	not provided	-0.36% (-34.0 Btu/Kwh) NPHR change	
Annual savings from advanced design installation	209,260		400,805	
Reasons for award or rejection	- Low bidder for both conventional and advanced design with savings factored in. - Reliable and proven advanced design . - Cost under budgeted amount	- No savings from advanced design - No details on equipment offerings or installation.	- Not low bidder - Bid above budgeted amount. - Questionable durability of advanced design guardian posts and vortex shedder strips. Annual savings will decrease.	- High bidder for conventional pkg. - No advanced design offered.